

# Contents

---

<i>Preface to Third Edition</i> .....	(vii)
<i>Preface to Second Edition</i> .....	(ix)
<i>Acknowledgements</i> .....	(xi)

## **PART I**

### **STATISTICAL METHODS**

<b>1. INTRODUCTION</b> .....	<b>3</b>
<b>2. COLLECTION, CLASSIFICATION AND TABULATION OF DATA</b>	
2.1 Collection of Data .....	5
2.2 Classification of Data .....	6
2.3 Tabulation of Data .....	7
<b>3. FREQUENCY DISTRIBUTION</b>	
3.1 Frequency Distribution .....	10
3.2 Diagrammatic Representation.....	12
3.3 Graphic Representation .....	16
<b>4. MEASURES OF LOCATION</b>	
4.1 Arithmetic Mean .....	25
4.2 Median .....	28
4.3 Mode .....	30
4.4 Geometric Mean .....	31
4.5 Harmonic Mean .....	32
<b>5. MEASURES OF DISPERSION</b>	
5.1 Range .....	37
5.2 Quartile Deviation: (Semi-inter quartile range) .....	37
5.3 Mean Deviation .....	39
5.4 Standard Deviation.....	41
5.5 Coefficient of Variation.....	43
5.6 Statistical Population .....	43
5.7 Sample .....	44
<b>6. MOMENTS, SKEWNESS AND KURTOSIS</b>	
6.1 Moments .....	48

6.2	Skewness .....	49
6.3	Kurtosis .....	51
<b>7.</b>	<b>ELEMENTARY PROBABILITY</b>	
7.1	Definition of Probability .....	55
7.2	Mutually Exclusive Events .....	56
7.3	Mutually Independent Events .....	57
7.4	Dependent Events .....	58
7.5	Sub-populations .....	59
7.6	Probability Based on Binomial Distribution .....	60
7.7	Bayes Theorem .....	62
<b>8.</b>	<b>BINOMIAL AND POISSON DISTRIBUTIONS</b>	
8.1	Binomial Distribution .....	65
8.2	Properties of Binomial Distribution .....	66
8.3	Fitting of the Binomial Distribution .....	67
8.4	Poisson Distribution .....	68
8.5	Properties of Poisson Distribution .....	69
8.6	Fitting of a Poisson Distribution .....	69
<b>9.</b>	<b>NORMAL DISTRIBUTION</b>	
9.1	Standard Normal Distribution .....	75
9.2	Frequency Function .....	76
9.3	Properties of Normal Distribution .....	76
9.4	Distribution Function .....	77
9.5	Fitting of the Normal Distribution .....	79
<b>10.</b>	<b>TESTS OF HYPOTHESES</b>	
10.1	Introduction .....	83
10.2	One Sample Test: Case (i) .....	85
10.3	Two Sample Test: Case (i) .....	87
10.4	Student's t-distribution .....	89
10.5	One Sample t-test .....	90
10.6	Two Sample t-test .....	93
10.7	Paired t-test .....	95
10.8	S.N.D. Test for Proportions .....	98
10.9	One-Tailed Tests .....	101

**11. CHI-SQUARE DISTRIBUTION**

11.1 Chi-square Distribution.....	107
11.2 Properties .....	107
11.3 Chi-square Test of Goodness of Fit .....	108
11.4 2 × 2 Contingency Table .....	109
11.5 r × s Contingency Table.....	114
11.6 $\chi^2$ -test for Genetic Problems.....	116
11.7 $X^2$ -test for Linkage Problems.....	119

**12. CORRELATION AND REGRESSION**

12.1 Introduction.....	125
12.2 Test of Significance of Simple Correlation Coefficient .....	127
12.3 Fisher's Z-transformation .....	129
12.4 Rank Correlation.....	131
12.5 Coefficient of Contingency .....	133
12.6 Correlation of Attributes .....	133
12.7 Regression .....	133
12.8 Regression vs. Correlation .....	138

**13. MULTIPLE REGRESSION AND CORRELATION**

13.1 Introduction.....	144
13.2 Multiple Linear Regression Based on Two Independent Variables.....	144
13.3 Partial Correlation.....	148
13.4 Multiple Linear Regression with more than Two Independent Variables.....	150

**14. D<sup>2</sup>-STATISTICS AND DISCRIMINANT FUNCTIONS**

14.1 D <sup>2</sup> -Statistics .....	158
14.2 Discriminant Functions .....	162

**15. INTRODUCTION TO PROBIT ANALYSIS**

15.1 Introduction.....	166
15.2 Analysis of Biological Data .....	167
15.3 Maximum Likelihood Method .....	173
15.4 Application to Economic Data.....	175

**Part II**  
**EXPERIMENTAL DESIGNS**

**16. EXPERIMENTAL DESIGNS**

16.1	Introduction.....	181
16.2	Uniformity Trial.....	182
16.3	Analysis of Vartance .....	183
16.4	Completely Randomized Design .....	183
16.5	Duncan's Multiple Range Test .....	188
16.6	Transformations .....	189
16.7	Randomized Block Design .....	191
16.8	Latin Square Design .....	196
16.9	Cross Over Design .....	203
16.10	Factorial Experiments.....	205
16.11	Split-plot Design.....	236
16.12	Split-Split Plot Design .....	247
16.13	Strip Plot Design .....	251
16.14	Analysis of Covariance .....	254
16.15	Tukey's Test of Additivity.....	259
16.16	Random Effects Models .....	261
16.17	Mixed Models.....	264
16.18	Henderson Methods.....	265
16.19	Compact Family Block Design.....	273
16.20	Simple Lattice Design.....	275
16.21	Combined Analysis of Experiments .....	280
16.22	Response Surface .....	282
16.23	Path Coefficient Analysis.....	289
16.24	Least Squares Proceduree-Two-way Analysis of Variance ...	293

**PART III**  
**SAMPLE SURVEYS, ECONOMIC AND NON-PARAMETRIC STATISTICS**

**17. SAMPLING METHODS**

17.1	Introduction.....	305
17.2	Simple Random Sampling.....	305
17.3	Stratified Random Sampling.....	310

17.4 Cluster Sampling .....	316
17.5 Two-stage Sampling .....	323
17.6 Systematic Sampling.....	327
17.7 Non-sampling Errors.....	328
17.8 Tolerances in the Testing of Seeds .....	328

**18. ECONOMIC STATISTICS**

18.1 Introduction.....	333
18.2 Analysis of Time-series Data .....	333
18.3 Index Numbers.....	349
18.4 Interpolation.....	358

**19. NON-PARAMETRIC STATISTICS**

19.1 Introduction.....	363
19.2 Parametric vs Non-Parametric Tests.....	365
19.3 One-sample Tests.....	365
19.4 Two related Samples Tests .....	372
19.5 Tests for Two Independent Samples .....	378
19.6 Tests based on p related Samples ( $p > 2$ ).....	383
19.7 Tests based on p Independent Samples ( $p > 2$ ) .....	388
19.8 Coefficient of Concordance.....	391

**PART IV**

**MULTIVARIATE STATISTICAL METHODS**

**20. MULTIVARIATE STATISTICS METHODS**

20.1 Multivariate Normal Distribution .....	401
20.2 Classification by Linear Discriminant Function.....	411
20.3 Principal Component Analysis.....	414
20.4 Factor Analysis.....	418
20.5 Canonical Correlations .....	427

**PART V**

**ECONOMETRICS**

**21. TWO-VARIABLE LINEAR MODEL**

21.1 Two-Variable Linear Model.....	433
-------------------------------------	-----

**(xviii) Contents**

---

21.2	The General Linear Model.....	439
21.3	Auto Correlation .....	441
21.4	The Durbin - Watson d Statistic .....	443
21.5	Multicollinearity .....	443
21.6	Lagged Variables .....	445
21.7	Heteroscedasticity .....	448
21.8	Dummy Variables.....	450
<b>References and Bibliography .....</b>		<b>457</b>
<b>Appendices.....</b>		<b>461</b>
<b>Index .....</b>		<b>495</b>